**Template | Unit Enhancement**

***ENGINEERING DESIGN***

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**Background Information**

**Instructional Materials Title: Circuits and Pathways**

**Publication Date: August 23, 2013**

**Work Group Participants: Kelly Kennedy, Tamara Alston, Onny Tabares, Corinne Grandbois**

**Date Developed: August 23, 2013**

**High Leverage Lesson (Title and Page Number): Additional Lesson for End of Unit Engineering Assessment**

**Rationale**

· **Why we identified this particular lesson**

**- Connections to NGSS and WA Science Standards**

This lesson is a culminating activity for students to apply their understanding of the scientific concepts covered during the unit, including complete circuits and switches. It is an opportunity to focus on the “Developing Solutions” part of the Engineering Design Process.

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***Engineering* Lesson Enhancement**

**Overview**

· **Identification of where within the High Leverage Lesson to insert enhancement**

· **Key instructional strategies and tools needed**

**Engineering Design Challenge: Students will design a night time reading device that can be transported and conserves battery power.**

**Part 1: Lesson Modifications to Lead Up to *Engineering Task***

There are no lesson modifications. This is an end-of-unit culminating activity.

**Part 2: *Engineering* Learning Sequence**

1. Day 1: Discuss the challenge and display materials to students.
2. Discuss what types of scientific concepts students will need to utilize in order to be successful.
3. Students create a design plan by sketching a labeled diagram (model) in science notebook.
4. Share design plan with a partner and partner provides feedback regarding design.
5. Gather materials and begin creating first prototype. Give the rest of the period (about 30 mins or so). Going through design process of on-going revision.
6. Meet with partner to collaborate around challenges, successes, feedback (ongoing during first phase of design process).
7. At end of first session, have a gallery walk to see different designs, including Q and A.
8. Exit Ticket (optional): What are some challenges you experienced today? What are some successes you experiences today?
9. Day 2: Optimizing the design
10. Write up step-by-step procedure (or instructional manual) and final design labeled diagram.
11. Write to answer prompt, “Explain why/how does your design works?” Must use specific required scientific vocabulary.

12. Final design and writing pieces are assessed.

**Part 3-A: Engineering Task**

*Describe the Engineering Task that students will engage in.*

Problem: Create a night time reading device (flashlight) that conserves battery power (can turn on and off).

Constraints: Time—2 days (one day to build initial model, 2nd day to optimize the design)

Materials—EXPO marker with insides removed, LED light, coated copper wire, electrical tape, toilet paper roll, paper clip, AA batteries, incandescent light bulb, string or shoe laces, velcro

Criteria: Size—no bigger than 6 in (can fit in your pocket/sandwich size bag)

Has to turn on and off (have a switch)

Functional (have to be able to use it as a reading light)

Stays together in one piece/transportable (can be moved around without breaking)

**Part 3-B: Assessment Rubric**

**Project Assessment Rubric:**

Will contain the criteria for solving the problem: size, switch, functionality (bulb lights), transportable

Switch and functionality are the essential criteria, while size and transportable are secondary criteria.

Rubric will be simple YES/NO to each of 4 parts.

Meets Standard: Design meets both essential criteria and one or more secondary criteria.

Approaching Standard: Design meets one of the essential criteria and one of the secondary criteria.

Below Standard: Design doesn’t meet either of the essential criteria.

**Writing Assessment Rubric:**

Meets Standard: Includes switch use, how light bulb lights, and understanding of electric current. Uses range of scientific vocabulary.

Approaching Standard: Includes two of the three scientific concepts. Uses some scientific vocabulary.

Below Standard: Limited scientific content knowledge and vocabulary.

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**Additional Information**

NOTES

· Information that will be useful when teaching this lesson

- Resources that will be useful

- Scaffolds that students will use

Partner collaboration during designing model

Partner collaboration while designing

Gallery walk to see others designs

Possible anchor charts posted

Science notebooks as reference tool

Focus on one section of the design process at a time

Vocabulary posted in pocket chart

Show video of Caine’s Arcade to excite kids about engineering, accessed through the PSEPonline wiki.

For special needs students, maybe have specific design instructions made for them to follow—build one specific model rather than trying to come up with a design on their own. Utilize support of an IA when possible.

Option for oral explanations for students who struggle with expressing their ideas in writing.